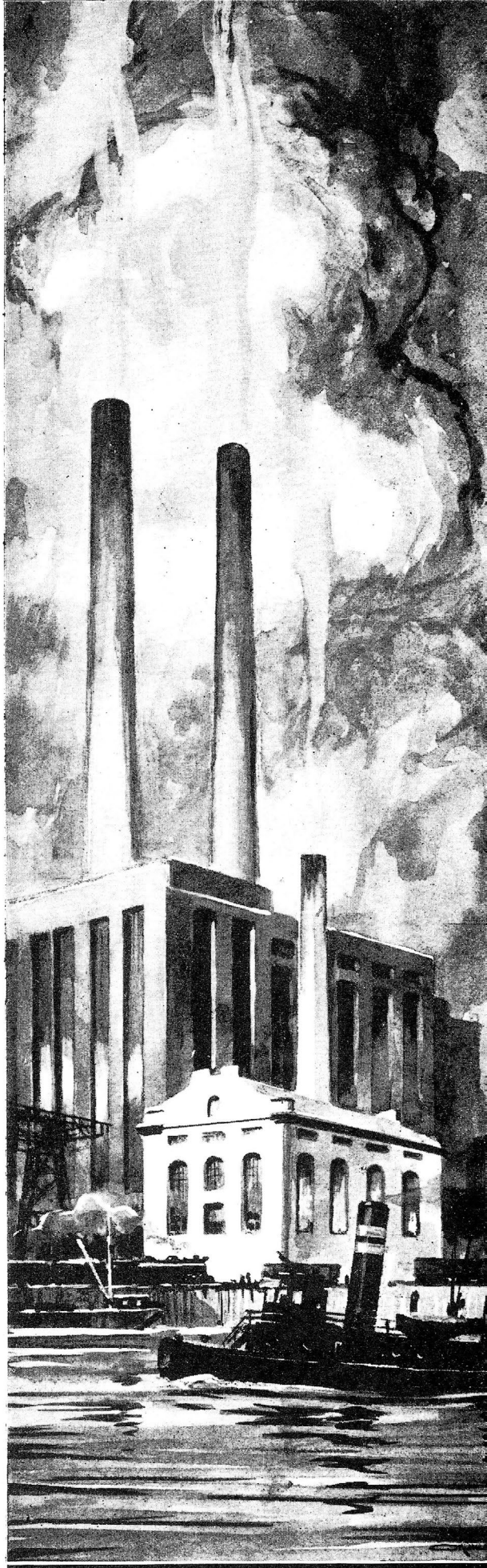
CE-HEINE BOILERS



BOILER PLANT EQUIPMENT
for all steam requirements in the stationary and marine fields

C-E

COMBUSTION ENGINEERING COMPANY • INC

COMBUSTION ENGINEERING BUILDING • 200 MADISON AVENUE • NEW YORK

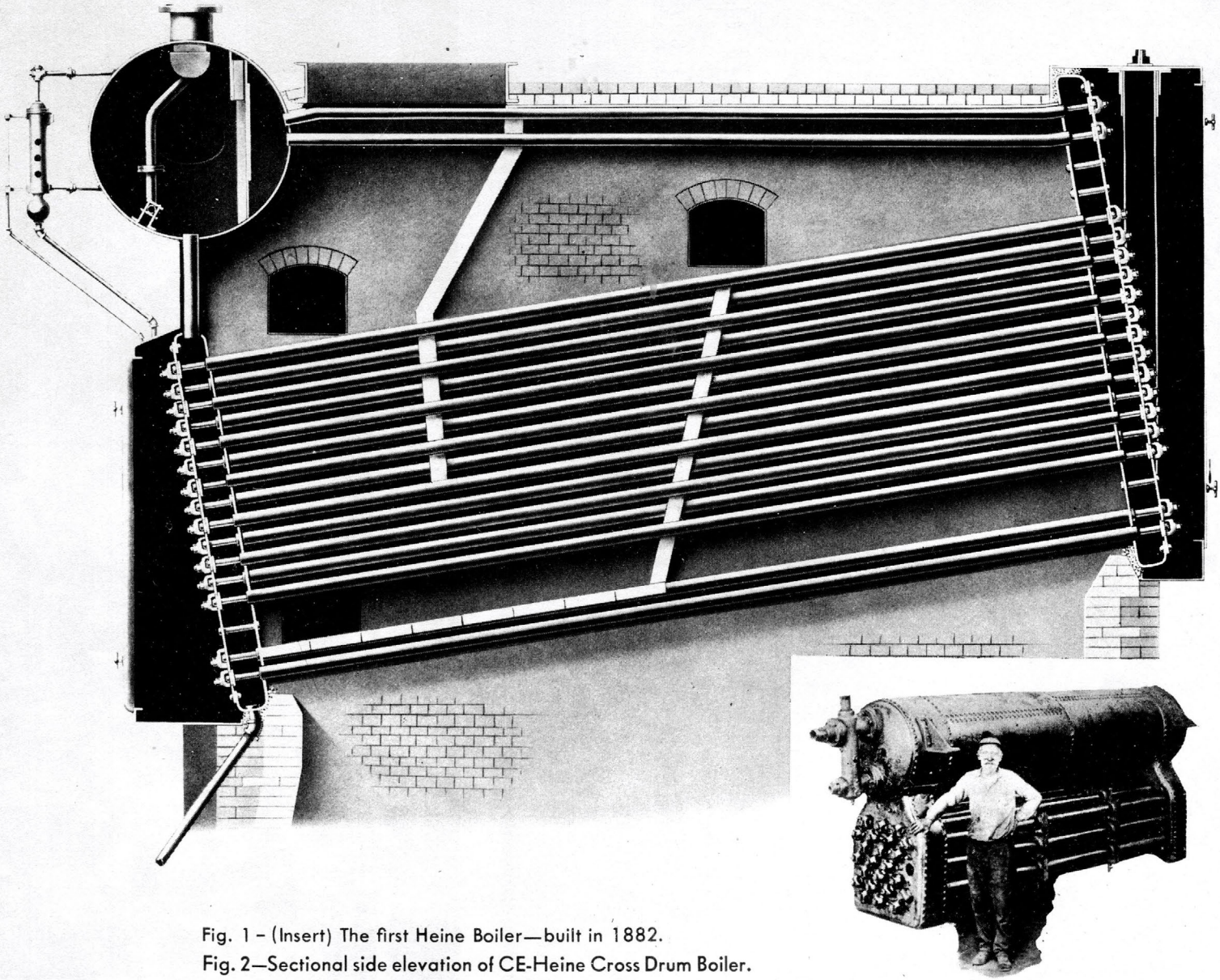


Fig. 1 – (Insert) The first Heine Boiler—built in 1882.
Fig. 2—Sectional side elevation of CE-Heine Cross Drum Boiler.

CE-HEINE BOILERS

CE-Heine Box Header Boilers are built in both cross and longitudinal drum types and in various designs and sizes to meet any conditions likely to be encountered in plants for which box header boilers are suitable. These conditions require sizes in the range from about 1000 to 12,000 sq ft of heating surface and pressures up to approximately 275 lb per sq in.

Cross Drum Boilers. This type, illustrated by Figs. 2 and 4, is generally more suitable than the longitudinal drum type for wide settings. The downtake or rear header is connected to the drum by vertical circulating nipples. The uptake or front header is connected to the drum by two rows of horizontal circulating tubes. The tubes connecting the headers may be baffled longitudinally by tile or crosswise by monolithic refractory. The gas outlet may be arranged either at the top of the boiler or below the drum.

Longitudinal Drum Boiler. This type, illustrated by Figs. 5, 6, 7 and 8, is especially suited to narrow settings, for which applications it provides a maximum of steam and water space. It may, however, be built with two drums for wider settings. Drums may be arranged horizontally or slightly inclined. With the inclined drum design, both uptake and downtake headers converge to openings in the drum and are attached to the shell by rivets. With the horizontal drum design, the downtake header is connected to the drum by circulators bent to enter the shell radially as shown in Fig. 5. The latter arrangement permits the gas outlet to be located under the drum. Where gases can be removed from the top of the

Copyright 1946—Combustion Engineering Company, Inc.

boiler, the inclined drum design has some advantage over the horizontal drum design in that it requires less headroom.

The same baffling arrangements referred to in connection with cross drum boilers may be used on longitudinal drum boilers.

Box Headers. Two methods of header fabrication are employed, one of which is illustrated by Figs. 3 and 4 and the other by Fig. 6. In the header illustrated by Figs. 3 and 4, the handhole sheet is a flat plate and is riveted to the tube sheet which is bent at the edges to bring the seam on the outside face of the header. This construction is used for both uptake and downtake headers on the cross drum boiler and for the downtake header on the horizontal longitudinal-drum boiler. In the header illustrated by Fig. 6, both handhole and tube sheets have bent edges and are connected by a riveted lap joint at the bottom and sides. The top of the header converges to an opening in the drum. This construction is used for both uptake and downtake headers on the inclined longitudinal-drum boiler and for the uptake header only on the horizontal longitudinal-drum boiler.

In both header designs, the riveted joints are readily accessible for inspection and are not exposed to high temperatures.

The header plates are stayed against internal pressure by staybolts screwed into accurately threaded holes. In cross baffled boilers, the staybolts are solid except for the ends which are drilled for expanding and beading. In longitudinally baffled boilers, they are hollow to facilitate cleaning of the outside surfaces of the tubes.

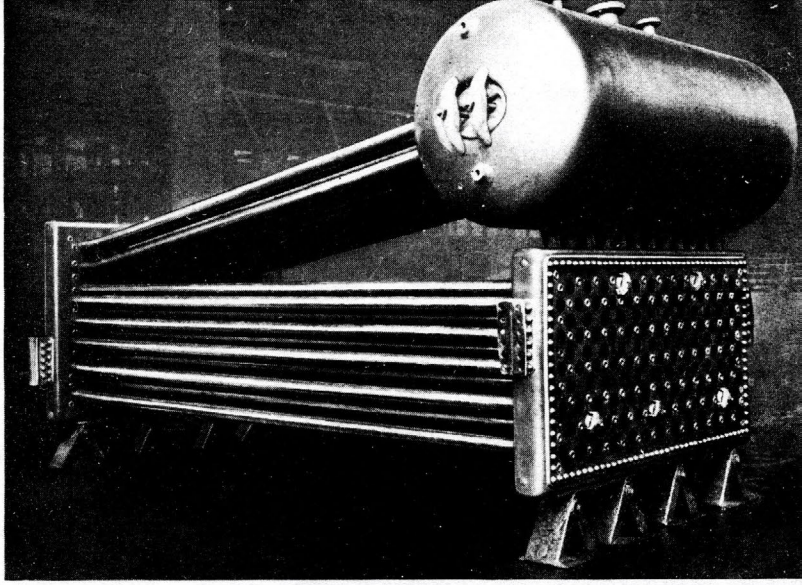


Fig. 4 — Shop view of CE-Heine Cross Drum Boiler with fusion-welded drum.

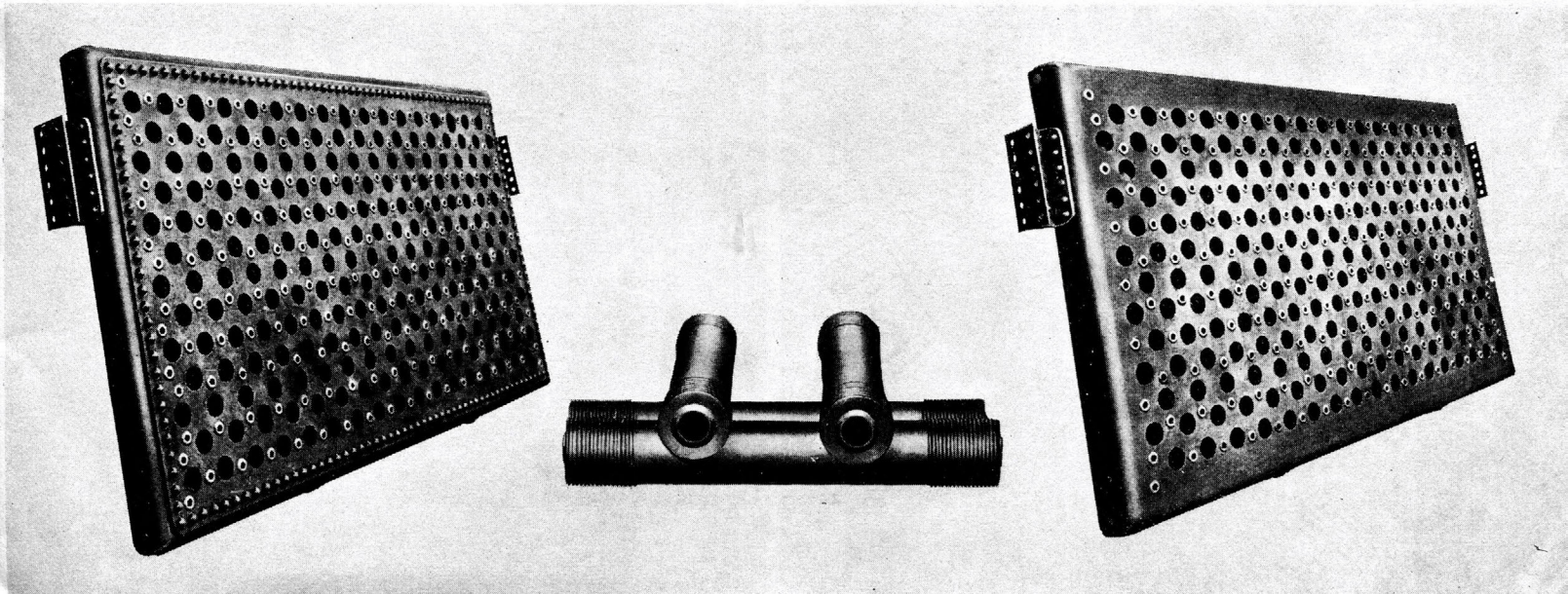
All staybolts have their threaded ends expanded into the header sheets, after which a bead is formed at each end, resulting in added holding power and tightness.

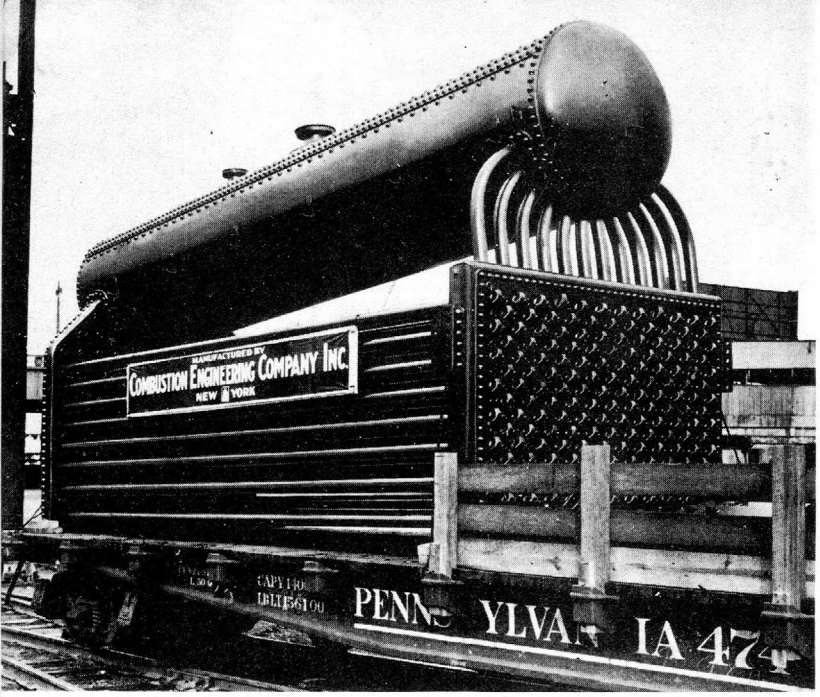
The handholes are circular except for a few that are elliptical to permit removal of handhole plates.

One or more openings for drain connections are provided in the downtake headers.

Handhole Closures. The design of the handhole closures is such that the internal pressure tends to tighten the joints. The type most generally used is a handhole plate with outside yoke

Fig. 3—(Left) Handhole side of box header used at uptake and downtake ends of cross drum boilers and at downtake end of horizontal longitudinal-drum boilers. (Center) Threaded staybolts which are expanded in the header plates after which the ends are beaded. These provide support for the header plates against the internal pressure. (Right) Tube side of header shown at left. There are no seams or rivets within the hot gas or fire zones.





through which the bolt passes. Gasket bearing surfaces on the handhole plates as well as on the handhole sheet are machined.

Drums. The usual inside diameters of drums for cross drum boilers are 48 in. or 54 in., and for longitudinal-drum boilers—36, 42 or 48 in. Drums may be either fusion welded or riveted with single-seam, double-strap butt joints.

Firebox quality steel is used throughout. A manhole with pressed steel cover may be placed in one or both ends of the drum, depending on the requirements.

Drum internals consist of steam baffle plates, a dry pipe connected to the steam outlet and a perforated feed pipe. In cross drum boilers, the steam baffles are placed in front of the circulator tube openings. In longitudinal-drum boilers, a baffle is placed above the uptake header opening.

Tubes. Steel tubes of 3½ in. outside diameter are furnished in all CE-Heine Boilers. The vertical spacing of the tubes in cross baffled boilers is greater than in those with longitudinal baffling.

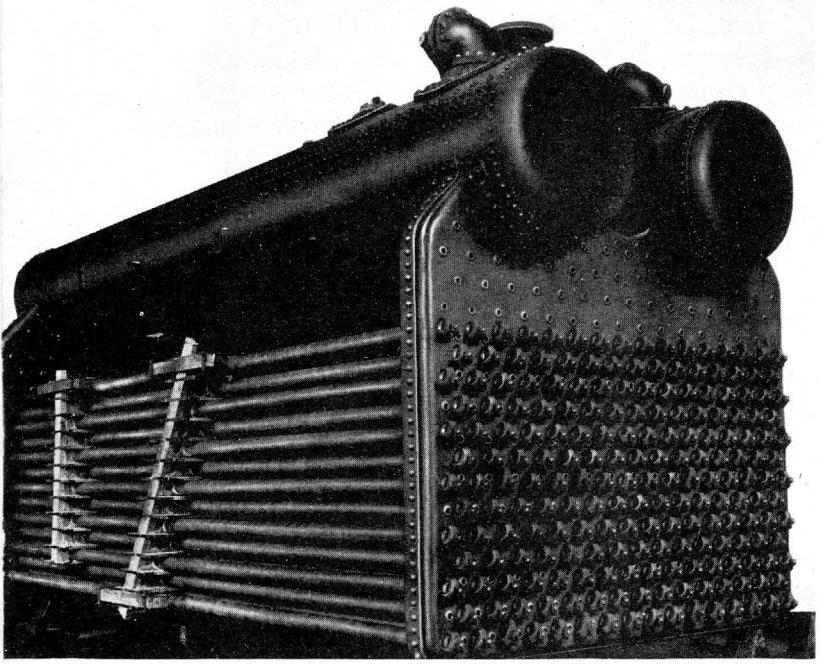
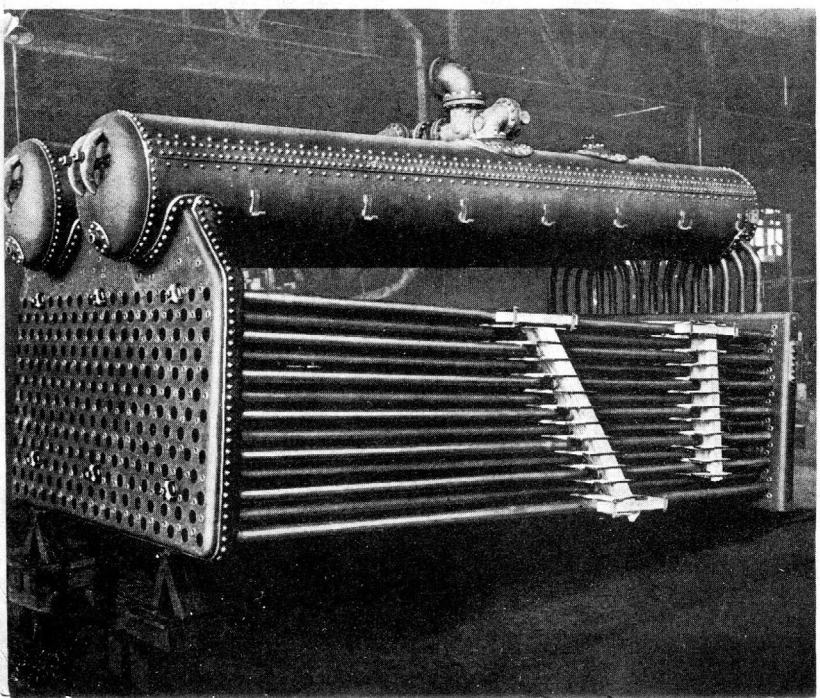


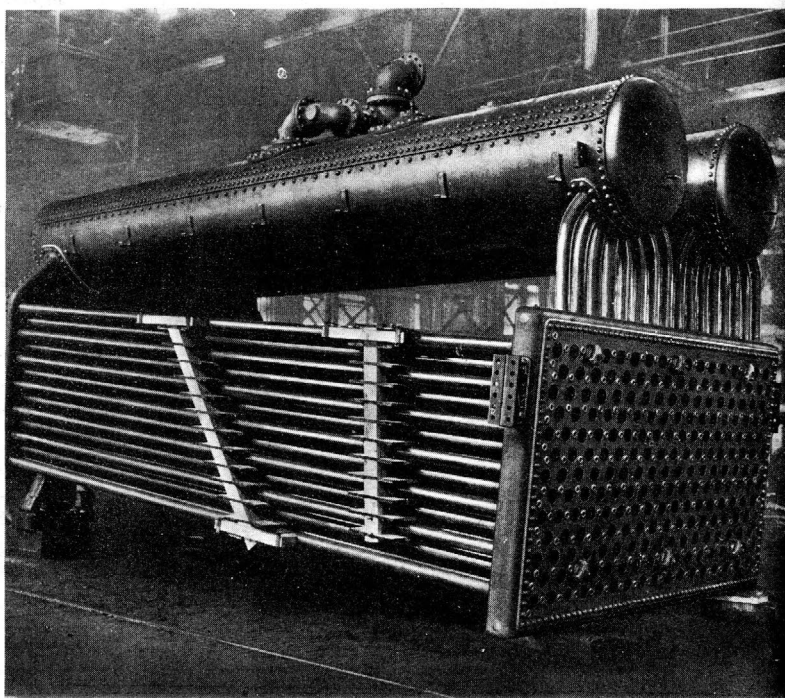
Fig. 5—(Upper) Horizontal longitudinal-drum boiler completely assembled and ready for shipment.

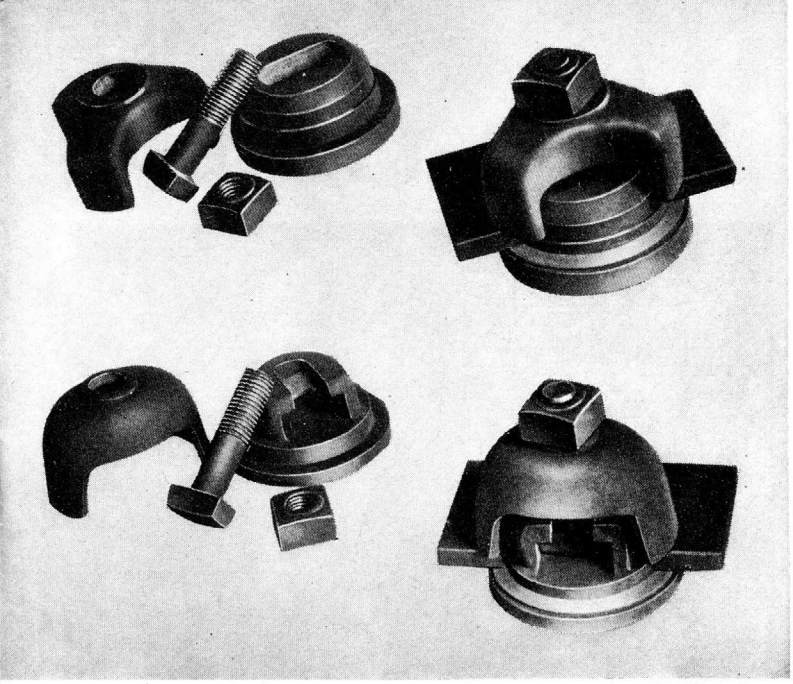
Fig. 6—(Middle) Shop view of inclined longitudinal-drum boiler taken from uptake end.

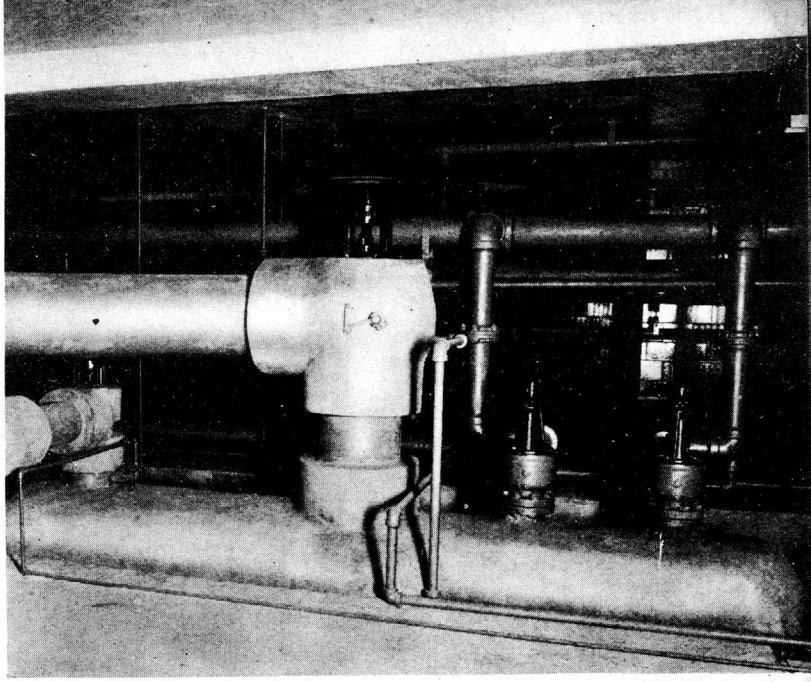
Fig. 7—(Lower left) Shop view of horizontal longitudinal-drum boiler taken from uptake end.

Fig. 8—(Lower right) Shop view of horizontal longitudinal-drum boiler taken from downtake end.









Each tube is accessible through its corresponding handhole and may be inspected and cleaned from the outside of the boiler at either end.

Baffles. Longitudinal or cross baffling, or combinations of these types, may be used on both longitudinal and cross drum boilers, as illustrated on Pages 6 and 7. Refractory tile, accurately molded to fit the tubes, are used for longitudinal baffling. Cross baffling is made up of CE-Heine "Refractite" molded while the tubes are being inserted. This construction assures tightness in addition to providing for the removal of tubes without damage to the baffles. The arrangement of the baffles depends on the fuel, draft, load and setting conditions.

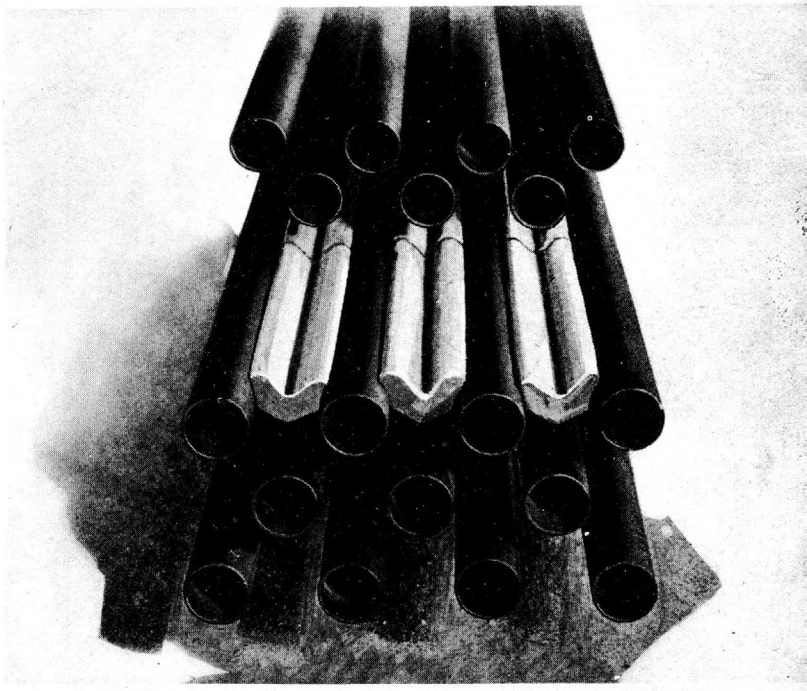


Fig. 9—(Upper left) Handhole fittings either of cast-iron (upper) or forged steel (lower) consist of plate, gasket, yoke, bolt and nut.

Fig. 10—(Upper right) View showing roof of a CE-Heine Cross Drum Boiler installation. Drum and discharge line are insulated. Soot blower connection is shown at left end of drum and safety valves at right end.

Fig. 11—Section through tube bank showing tile forming longitudinal baffle in place on tubes.

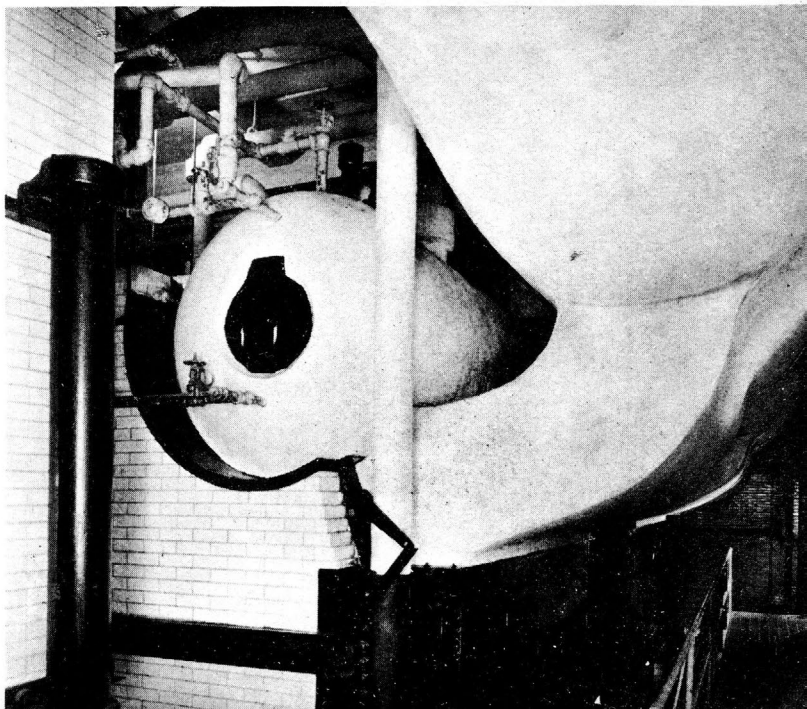


Fig. 12—Rear of CE-Heine Boilers at Bronx County Building, New York City. Safety valves, steam discharge line, manhead and water column connections are shown on the insulated drum. Damper operating lever is shown at lower end of flue connection.

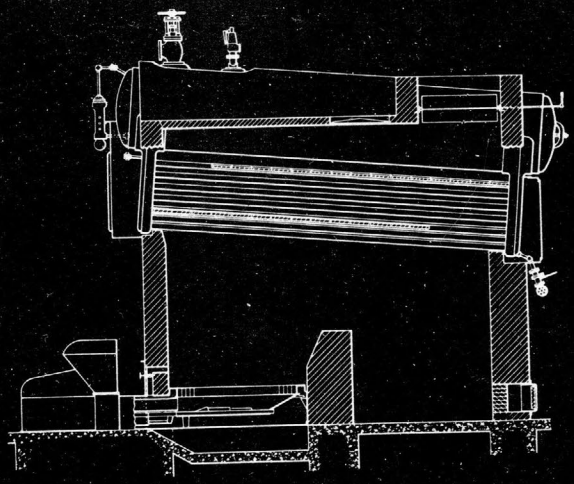


Fig. 13 — Inclined, longitudinal-drum, longitudinally-baffled boiler, gas outlet at top, CE-Skelly Stoker-Unit. Fuel—eastern bituminous coal. Boiler h.s.—1870 sq ft.

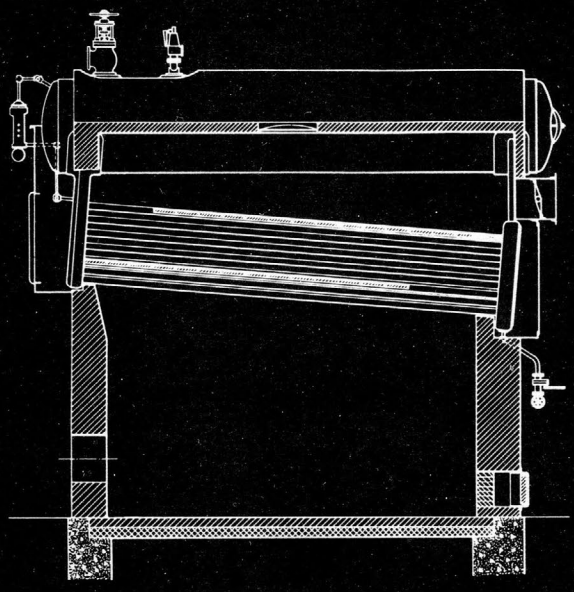


Fig. 14 — Horizontal, longitudinal-drum, longitudinally-baffled boiler with gas outlet under drum. Oil fired. Boiler h.s.—2820 sq ft.

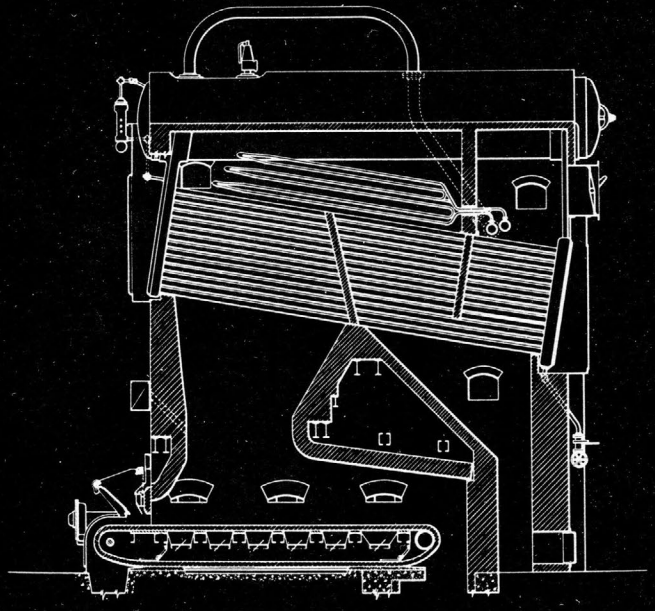


Fig. 15 — Horizontal, longitudinal-drum, cross-baffled boiler, gas outlet under drum, superheater, rear arch furnace, CE Chain Grate Stoker. Fuel—mid-western bituminous coal. Boiler h.s.—3850 sq ft.

TYPICAL

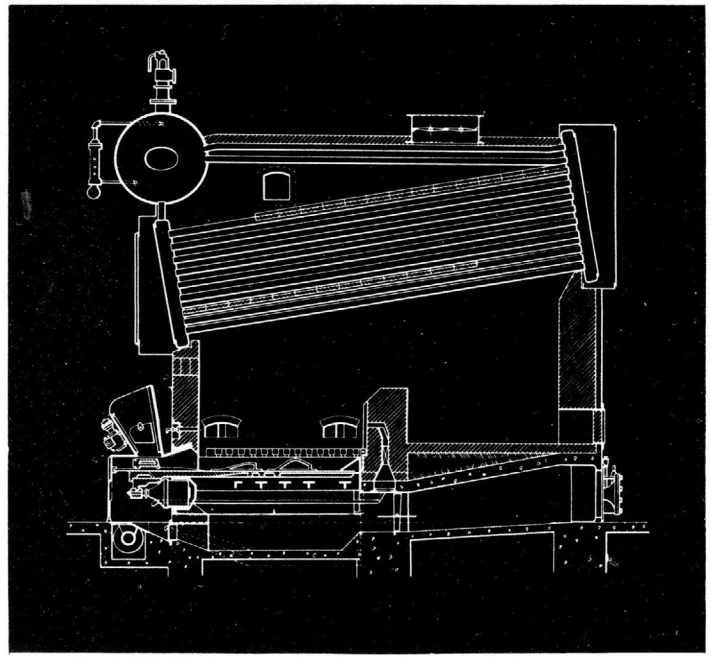


Fig. 16—Cross-drum, longitudinally-baffled boiler, gas outlet at top, CE Single Retort Stoker (Type E). Fuel—eastern bituminous coal. Boiler h.s.—2960 sq ft.

Supports. The downtake ends of both the cross drum type of boiler and the horizontal longitudinal-drum type of boiler are usually supported by lugs riveted to the side of the header and bolted to the structural steel supporting columns. Inclined longitudinal-drum boilers may be supported on the downtake end either by U-bolts or by supports under the header. The uptake end of the cross drum type of boiler is supported by suspension rods which pass through lugs riveted to the sides of the headers. The uptake end of either type of longitudinal drum boiler is usually supported by U-bolts passing around the drum. The suspension at the uptake end provides for expansion and contraction of the boiler without any effect on the brickwork which is independent of the boiler.

Casing. A reinforced, steel-plate upper front is supplied having front and rear doors for access to the headers and tubes. The lower front is furnished to conform with the requirements of the firing equipment.

Steam Quality. At normal ratings, the moisture content in the steam will be less than 1 per cent.

SETTINGS

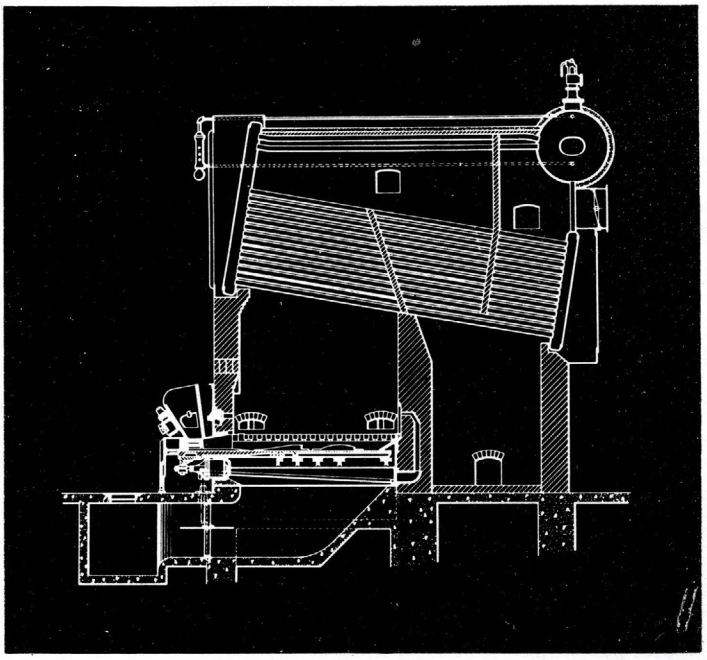


Fig. 17—Cross-drum, cross-baffled boiler, gas outlet under drum, CE Single Retort Stoker (Type E). Fuel—eastern bituminous coal. Boiler h.s.—4400 sq ft.

Superheaters. Both cross drum and longitudinal-drum boilers may be equipped with superheater surface. The drawings on Pages 6 and 7 show how superheaters may be installed.

Fusion Welding. The manufacturing equipment of CE boiler shops includes complete facilities for fabricating and testing fusion-welded boiler drums. The CE fusion welding process is the result of years of intensive research and development work which has included every practical method of weld testing. In all respects the results have equaled or exceeded the A.S.M.E. Code requirements for welded boiler drums.

Full-size drums, tested to destruction, have proved that the welded seams are as strong or stronger than the plate itself. In order to assure the reliability of welded boiler drums, all welded seams are X-rayed to prove the soundness of the welds, after which the entire drum is annealed in a specially designed furnace to eliminate stresses due to welding.

Shop Inspection. All tests are observed by a duly authorized inspector who sees that the completed product is properly stamped after the final hydrostatic test.

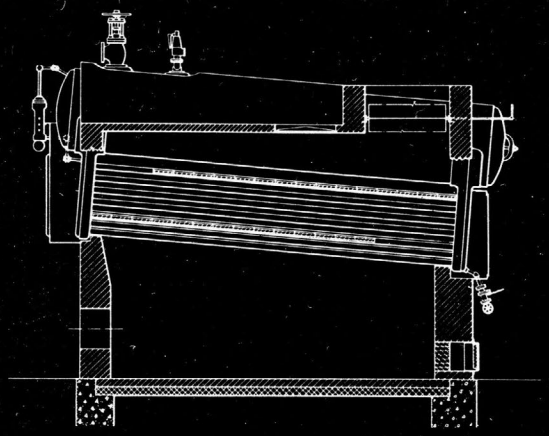


Fig. 18 — Inclined, longitudinal-drum, longitudinally-baffled boiler with gas outlet at top. Oil fired. Boiler h.s.—2440 sq ft.

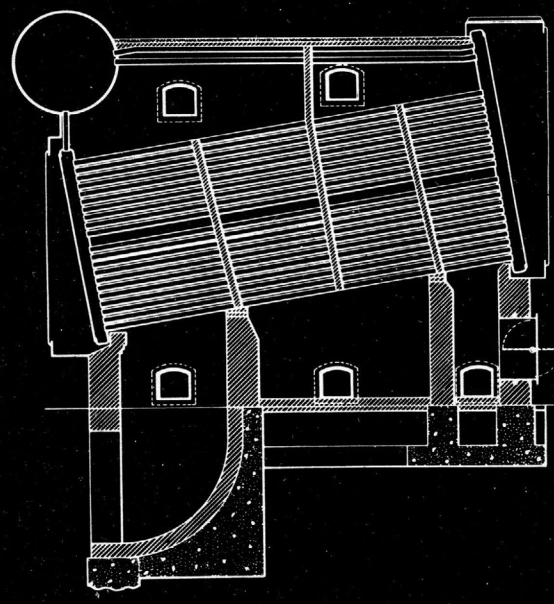


Fig. 19—Cross drum boiler with four passes for waste heat recovery. Boiler h.s.—6500 sq ft.

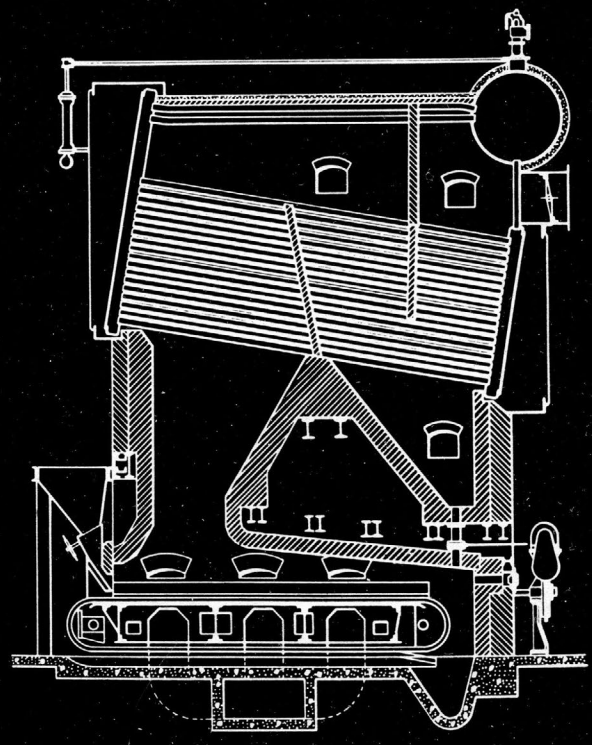


Fig. 20—Cross-drum, cross-baffled boiler, gas outlet under drum, rear arch furnace, CE-Coxe Stoker. Fuel—No. 3 buckwheat. Boiler h.s.—5020 sq ft.

C-E PRODUCTS

BOILERS

Sectional Header
Box Header
Bent Tube
Fire Tube
Marine
Forced Circulation
Electric
(Above list covers 23 different designs. Included are designs known by the trade names Heine, Walsh-Weidner, Casey-Hedges *and* Ladd)

STOKERS

Multiple-Retort Underfeed
Single-Retort Underfeed
Traveling Grate
Chain Grate
Spreader
(Above list covers 20 different designs. Included are designs known by the trade names Coxe, Green, Type E, Low Ram *and* Skelly)

PULVERIZED FUEL SYSTEMS

(for boilers and industrial furnaces)
Direct Fired
Storage
(C-E Pulverized Fuel Systems, formerly known as Lopulco, *include* Raymond *Pulverizers)*

FURNACES

Dry Bottom
Slagging
Water-Cooled Walls and Screens

STEAM GENERATING UNITS

Complete units of standardized design for a wide range of capacities. Coordinated designs comprising any combination of boiler, firing and related equipment.

ALLIED EQUIPMENT

Superheaters (Elesco)
Air Heaters
Economizers (Elesco)
Oil Burners

PULP MILL EQUIPMENT

C-E Recovery Unit

FABRICATED PRODUCTS

Pressure Vessels, Tanks, Towers, etc.
(welded or riveted fabrication —carbon, alloy or clad steel)

RAYMOND PRODUCTS*

(for industrial grinding, drying and separation)
Bowl Mills
Roller Mills
Automatic Pulverizers
Imp Mills
Screen Mills
Mechanical Air Separators
Flash Drying Systems
Incineration Systems

**Manufactured by the Company's Raymond Pulverizer Division*

District Offices and Representatives:

Birmingham, Ala., *Martin Building*
Boston, Mass., *Chamber of Commerce Building*
Charlotte, N. C., *Independence Building*
Chattanooga, Tenn., *1032 West Main Street*
Chicago, Ill., *Bankers Building*
Cincinnati, Ohio, *Gwynne Building*
Cleveland, Ohio, *Guardian Building*
Denver, Colo., *1940 Blake Street*
Detroit, Mich., *Book Building*
Hazleton, Pa., *Markle Bank Building*
Houston, Texas, *Mellie Esperson Building*
Kansas City, Mo., *Board of Trade Building*
Los Angeles, Calif., *Petroleum Building*
New York, N. Y., *200 Madison Avenue*
Philadelphia, Pa., *1616 Walnut Street*
Pittsburgh, Pa., *First National Bank Building*
St. Louis, Mo., *5319 Shreve Avenue*
St. Paul, Minn., *786 Eustis Street*
Salt Lake City, Utah, *210 So. West Temple Street*
San Francisco, Calif., *Monadnock Building*
Washington, D. C., *1603 K Street, N. W.*

In addition to the District Offices listed above the Stoker Division maintains District Representatives in principal cities throughout the U. S.

Buenos Aires, Argentina, *Mellor-Goodwin, S. R. L., Paseo Colon 221*
Caracas, Venezuela, *Mr. Joaquin Avellan, Sur 25—Los Caobos*
Lima, Peru, *A. y F. Wiese S. A.*
Rio de Janeiro, Brazil, *Sociedade Termotecnica, Mellor-Goodwin, Ltda., Caixa Postal 3525*
Santiago, Chile, *Engineering & Construction, Ltd., Casilla 2287*
Shanghai, China, *Andersen, Meyer & Co., Ltd., 21 Yuen Ming Yuen Road*

Havana, Cuba, *Woodward, Gilbert & Compania, Edificio Metropolitana, 739-41, Apartado 1650*
Honolulu, Hawaii, *W. A. Ramsay, Ltd., P. O. Box 1721*
Ponce, Porto Rico, *Porto Rico Iron Works*

Canadian Associates:
Combustion Engineering Corporation, Ltd.

Montreal, *Dominion Square Building*
Toronto, *Canadian Pacific Railway Building*
Vancouver, *1155 6th Avenue, West*
Winnipeg, *Confederation Life Building*

Printed in U.S.A.